

A REVISION OF THE GENUS *KYLLINGA* ROTTB.  
(CYPERACEAE) IN MEXICO AND CENTRAL AMERICA

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ABSTRACT

A revision based on herbarium study of the six species of *Kyllinga* occurring in Mexico and Central America is presented. Each species is described and discussed. Distribution maps, a key to the species, and a detailed discussion of taxonomically useful characters in the genus are included.

Key Words: Cyperaceae, *Kyllinga*, Mexico, Central America

The genus *Kyllinga* consists of some 40 to 45 species (Kükenthal, 1935–36; Lye, 1981). Nearly all are tropical, with no more than ten occurring in temperate regions. The greatest diversity is in tropical Africa and Madagascar, where as many as 35 species are found. In the New World, there are eight species, two of which, *K. brevifolia* and *K. odorata*, are pantropic. Three of the species occurring in the New World, *K. odorata*, *K. pumila* and *K. brevifolia*, occur in the United States (Delahoussaye and Thieret, 1967). One species, *K. nudiceps*, is endemic to Cocos Island, Costa Rica.

Some workers include *Kyllinga* as a subgenus of *Cyperus*. However, *Kyllinga* differs from *Cyperus* in its two-scaled, one-flowered spikelets. The dense, sessile spikes of *Kyllinga* give the plants a different aspect from most species of *Cyperus* with their usually open, branched inflorescences. The majority of recent specialists on *Cyperus* and on the Cyperaceae have recognized *Kyllinga* as a distinct genus. Some proponents of *Kyllinga* as a distinct genus include: Standley and Steyermark (1958); Koyama (1978) in the *Flora of the Lesser Antilles*; Raynal (1973) who worked at different times on the Cyperaceae of Africa, Madagascar and New Caledonia; Vorster unpubl. Ph.D. dissertation, U. Pretoria, 1978 who studied the southern African species, as well as the genus *Cyperus*; and Lye (1981) who studied the East African Cyperaceae.

Raynal (1973) hypothesized that *Kyllinga* probably represented an advanced group derived from *Cyperus*. He based this conclusion on a similarity of habit of certain African species of Section *Mariscus* (Vahl) Benth of *Cyperus* to that of some species of *Kyllinga*. I know of no other evidence to support Raynal's conjecture, but am

willing to agree that *Kyllinga* is closely related to *Cyperus*. A satisfactory understanding of the phylogenetic relationships of *Kyllinga* must await adequate study of the African species.

Several regional treatments have been published for Mexico and Central America. O'Neill (1940) provided a treatment of the three species (*Kyllinga pumila*, *K. brevifolia* and *K. tibialis*) occurring in the Yucatan Peninsula, which included the Mexican states of Campeche, Yucatan and Quintana Roo, the Guatemalan department of Petén, and all of Belize. Ayers (1946) included *K. odorata*, *K. pumila* and *K. brevifolia* in his taxonomic treatment of the genus *Cyperus* in Mexico. Standley and Steyermark (1958) included *K. pumila*, *K. brevifolia*, *K. vaginata* and *K. tibialis* in their account of the Cyperaceae of the *Flora of Guatemala*. However, they overlooked *K. odorata*, misdetermining the three sheets of it at F as "*K. pumila*" or "*K. brevifolia*." Svenson (1943) treated *K. pumila*, *K. brevifolia*, *K. odorata* and *K. tibialis* in the *Flora of Panama*; the present treatment adds one species, *K. vaginata*, to the flora of that country. Standley (1938) included all six species of the present treatment in his *Flora of Costa Rica*. Spellman *et al.* (1975) listed for Belize only two out of the five species found there in the present treatment. Molina R. (1975) omitted *K. odorata* from his enumeration of the plants of Honduras. Standley (1931) recognized six species of *Kyllinga* in his account of the Cyperaceae of Central America.

Need for the present treatment of this genus is shown by lack of any recent study covering the entire area from Mexico to Panama. Many of the treatments made for a particular single country, while useful, usually are based on few collections. Unless specializing in the genus or family in question, an author usually does not see enough collections to observe and describe adequately the variation within each species. Further, species represented in a country by only a very few collections may be overlooked because a non-specialist has not had sufficient opportunity to learn to recognize the species. About 40% of the specimens seen during the present study had been misidentified, a state of affairs which emphasizes the need for an up-to-date revision of the genus for the region.

The present treatment has been made in conjunction with a taxonomic revision of *Cyperus* in Panama and Costa Rica (Tucker, 1983) and northern Central America and Mexico. Several compari-

sons can be made between the two genera, *Kyllinga* and *Cyperus*. In general, the author has found fewer taxonomically useful characters in *Kyllinga* as compared with *Cyperus*, owing in large part to the differences in inflorescence structure between the two genera. The inflorescences of *Kyllinga*, composed of a sessile spike or spikes, lack the rays, branches and various arrangement of spikes and spikelets that are useful in recognizing species in *Cyperus*. Also, the two-scaled, one-flowered spikelets of *Kyllinga* show comparatively little variation throughout the genus, whereas in *Cyperus* the spikelets exhibit considerable variation in length, width, imbrication of scales, and presence of rachilla wings, as well as others.

The habitats of the six species of *Kyllinga* treated here are in general very similar. Label data indicate they are plants of open, often disturbed and usually moist situations. Such habitats include roadside ditches, pastures, marshes but not wooded swamps, newly graded roadbanks, gravel pits, river and lake shores, and thickets. In addition, *K. odorata* occurs in pine and oak forests, and in thorn woodlands. The most specific in habitat is *K. tibialis*. It is always found close to the Caribbean on coastal dunes, under littoral trees and shrubs, and in swales behind the dunes.

The present treatment includes a key designed to be useable on specimens with or without underground parts. The descriptions are based on examination of some 600 herbarium specimens from the institutions listed in the Acknowledgments. A summary of the distribution and phenology follows each species description, as well as a listing of representative specimens. For the rare species, *Kyllinga vaginata* and *K. nudiceps*, all specimens seen are cited in detail. A citation of all specimens examined for this study is made in the Index of Exsiccatae.

#### COMMENTS ON TAXONOMICALLY USEFUL CHARACTERS

**RHIZOMES.** Five of the six species of the present treatment are rhizomatous. Only *Kyllinga pumila* lacks rhizomes, being instead densely cespitose. In *K. nudiceps*, *K. tibialis* and *K. vaginata*, the rhizomes are always conspicuous provided that underground parts have been gathered intact. In *K. brevifolia*, the internodes of the rhizome are sometimes very short, about 1 mm in length, thus producing a tuft of approximate culms that suggests the cespitose species *K. pumila*. Such tufted plants of *K. brevifolia* will often also

produce elongate rhizomes with the culms spaced 5–15 mm apart. Tufted plants of *K. brevifolia* can be distinguished from *K. pumila* by their longer anthers (0.8–1.1 mm vs. 0.2–0.4 mm) and the vertical orientation of the longest inflorescence bract in *K. brevifolia*; the longest inflorescence bract in *K. pumila* is horizontal to reflexed.

LEAVES. All species except *Kyllinga nudiceps* have been observed with leaf blades. Three species, *K. brevifolia*, *K. pumila* and *K. odorata* always bear leaf blades, and these leaf blades are linear-lanceolate with acute apices. The remaining two species, *K. vaginata* and *K. tibialis*, usually lack leaf blades. In these two species, the leaf blades, when present (on about 1/3 of the collections seen in this study), are linear, with the apex broadly rounded and usually mucronate. The presence or absence of leaf blades has been a source of confusion between *K. tibialis* and *K. vaginata* (see comments under *K. vaginata*).

INFLORESCENCES. The inflorescence of *Kyllinga* consists of 1–4 sessile spikes subtended by 2–5 usually leaf-like bracts. The shape and number of the spikes is useful in dividing the Mexican and Central American species into two major groups, as indicated in the Key to the Species. The inflorescence bracts are an easily observed character useful in several instances. For example, the extreme reduction of the bracts in *K. nudiceps* separates this species from *K. vaginata* and *K. tibialis*. The erect orientation of the longest inflorescence bract in *K. brevifolia* separates that species from *K. pumila* and *K. odorata*, in which all the bracts are borne horizontally to reflexed. The length of the inflorescence bracts relative to the length of the spike has been a source of confusion between *K. tibialis* and *K. vaginata* (see comments under *K. vaginata*).

RACHIS. The rachis is that portion of the summit of the culm along which the spikelets are borne. In most species it is cylindrical to conical. A notable exception is *Kyllinga tibialis*, in which the rachis is a low dome-shaped to nearly spherical structure that is a distinctive character of this species. The shape of the rachis might seem a difficult or tedious character to observe, but such is not the case. In collections with several culms from a rhizome system, there is nearly always at least one older culm from which the spikelets have fallen, revealing the rachis. Shape of the rachis is the most reliable character separating *K. tibialis* from *K. vaginata* (see comments under *K. vaginata*).

**SPIKELETS.** Spikelets show little morphological variation in the genus *Kyllinga*, at least as it is represented in the New World. The kind of variation that does occur is mostly in dimensions of the spikelet. These differences have not been of much value in distinguishing related species or groups of species.

**SCALES.** Some variation in dimensions and in number of nerves has been noted, but none of this variation has proven to be of sufficient magnitude to distinguish species of *Kyllinga*. Color of scales is useful in one instance: the whitish scales of *K. odorata* distinguish it from other New World species which all have pale greenish, brownish or hyaline scales.

Presence of spinulose teeth on keels of the scales has been a source of confusion in descriptions of species. All the species of this treatment, with the exception of *Kyllinga nudiceps*, have been observed to have either smooth or spinulose-scabrellate keels. Plants of the same collection, and occasionally spikelets of the same plant, may have both smooth and scabrellate keels. Ayers (1946) used the character of smooth versus scabrellate keels to distinguish *K. odorata* from *K. brevifolia* and *K. pumila*. All three of these species have been observed either with smooth or with scabrellate keels. Thus Ayer's observation is not a reliable means of recognizing *K. odorata*.

**STAMENS.** A survey of the published descriptions of *Kyllinga* species usually reveals more than one count of the number of stamens per flower. For example, *K. brevifolia* has been reported to have one stamen per flower (Delahoussaye & Thieret, 1967); 3 to 1 stamens (Kükenthal, 1935-36; O'Neill, 1940); and 1-2 (-3) stamens (Kern, 1974). In the present study, about two-thirds of the flowers of *K. brevifolia* checked had 2 stamens; the remainder had a single stamen. These various reports suggest that stamen number is probably not a useful character in delimiting species.

The length of the anthers has been found to be a genuinely helpful and reliable character. In a collection with several to many culms, usually in at least one inflorescence spike the anthers will be exserted, and can thus be readily observed and measured. The small anthers of *K. pumila* provide a quick and reliable means of distinguishing that species from *K. brevifolia* (see key and comments under *K. pumila*).

ACHENES. Delahoussaye and Thieret (1967) stated that specimens of *Kyllinga* ought to be collected with mature achenes for critical determination. It is my observation that, in general, the achenes are less important to the taxonomy of *Kyllinga* than in any genus of the Cyperaceae with which I am familiar. O'Neill (1940) stated that *K. brevifolia* and *K. pumila* differ in achene width, but the present study cannot support this claim (see comments under *K. brevifolia*).

Delahoussaye and Thieret (1967) observed that the dark achenes of *Kyllinga odorata* with their contrasting whitish stipitate bases and apiculi are distinctive of the species. This is indeed a reliable means of recognizing this species, but the achenes must fully mature before the coloration pattern is apparent. This is the only instance in which the writer has found mature achenes to be helpful in determination. However, ripe achenes are not essential for critical identification since the whitish color of the scales, a characteristic unique to this species in Mexico and Central America, is evident even before anthesis.

Variation of length and width of achenes falls within a rather narrow range, 0.5 and 0.4 mm, respectively. The differences in dimensions are not sufficiently great to be useful or reliable in delimiting species (see discussion under *K. brevifolia*).

#### NOTES ON MEASUREMENTS

1. Height of the plant is given as length of the culm from its base to insertion of the inflorescence bracts. Height does not include length of the spike or inflorescence bracts.
2. Width of leaves, culms and spikes is measured at mid-length. Achenes are measured at the widest point.
3. Width of scales was measured at the widest point, in abaxial view, of a detached, rehydrated scale pressed flat against a flat surface. The width may be estimated as twice the distance from keel to margin of an intact scale viewed laterally.

#### TAXONOMIC TREATMENT

*Kyllinga* Rottb., Descr. Icon. Rar. Nov. Pl. 12. 1773. (nom. et orthogr. cons.). TYPE species: *K. brevifolia* Rottb.

*Cyperus* subgenus *Kyllinga* (Rottb.) Valck. Sur., Gesl. Cyp. Mal. Arch. 42. 1898.

Herbaceous cespitose annuals or more frequently rhizomatous perennials. Culms smooth, trigonous or roundly trigonous, (5-) 20-50 (-100) cm tall, 0.5-3 mm thick. Leaves with blades (1-) 5-25 cm long, 1-5 mm wide, the margins and keel scabrellate; or leaf blades lacking, the base of the culm with 1-5 scarious-margined brownish sheaths. Inflorescence bracts 2-4, leaflike, up to 20 cm long and 6 mm wide, or greenish brown to brown, reduced, shorter than to equalling the spike. Inflorescence of 1-4 densely cylindrical to ovoid or spherical sessile spikes 6-15 mm long, 4-10 mm wide. Rachis slenderly cylindrical, conical or very nearly spherical. Spikelets usually very numerous, not readily distinguishable to the unaided eye, (15-) 50-150, densely packed on the rachis, ovate to lanceolate, (1.8) 2.2-3.8 (4.5) mm long, (0.7) 1-1.2 (1.4) mm wide, consisting of four scales: the two basal scales minute, brownish, sterile, 0.2-0.8 mm long; the two distal scales much longer, the lower of these two (the third of the spikelet) subtending a bisexual flower, the fourth scale slightly smaller, sterile, or infrequently bearing 1 or 2 stamens only. The fertile scale ovate, mucronate or mucronulate, (1.8) 2.4-3 (3.4) mm long, (0.8) 1.2-2 (2.6) mm wide, laterally 2-4 nerved, hyaline, whitish or pale greenish or reddish brown; keel greenish or whitish, smooth or spinulose-scabrellate, 1-3 nerved. Stamens 1, 2 or 3 per flower; filaments ribbon-like, reddish brown; anthers oblong-elliptic to linear, (0.2) 0.3-1.1 (1.3) mm long. Styles (0.4) 0.8-1.2 (1.8) mm long; stigmatic branches 2, (0.3) 0.6-1.5 mm long. Achenes lenticular, laterally flattened, narrowly ovate to oblong or elliptic, 1-1.2 (1.5) mm long, (0.4) 0.6-0.8 mm wide, apiculate, base cuneate to rounded, substipitate to decidedly stipitate, puncticulate, surface light brown to dark brown or reddish or brown.

KEY TO SPECIES OF *KYLLINGA* IN MEXICO AND CENTRAL AMERICA

1. Culms densely cespitose, rhizome lacking; anthers 0.2-0.4 mm long . . . . . 1. *K. pumila*.
1. Culms approximate to widely spaced on a usually conspicuous rhizome; anthers 0.4-1.1 mm long . . . . . (2)
  2. Longest inflorescence bract 4-10 times longer than the longest spike; spikes 1-4, ovoid to densely cylindrical . . . . . (3)
    3. Scales whitish; achenes dark with contrasting whitish stipitate base and apiculus; rhizome short, knotted, culms

- approximate; inflorescence bracts all horizontal to reflexed; culms bulbous-thickened at the base . . . . .  
 . . . . . 2. *K. odorata*.
3. Scales hyaline, pale brownish to greenish; achenes uniform light to medium brown; rhizome elongate, the culms (1-) 5-15 mm apart; the longest inflorescence bract erect, looking like a continuation of the culm, the other bracts ascendent to horizontal; culms slender at base . . . . .  
 . . . . . 3. *K. brevifolia*.
2. Longest inflorescence bract at most 3 times longer than the longest spike; spikes solitary (rarely a much smaller sessile one borne at the base of the spike), spherical to subglobose or hemispherical . . . . . (4)
4. Culms 0.8-2 mm thick at the apex, leafless or with leaf blades 2-5 mm wide; spikelets about 75-200; rhizomes horizontal, (2-) 3-5 mm thick; inflorescence bracts lanceolate, equalling or exceeding the spike . . . . . (5)
5. Spikes subglobose to ovoid; denuded rachis cylindrical to conical; scales of rhizome lanceolate . . . . .  
 . . . . . 4. *K. vaginata*.
5. Spikes spherical to globose; denuded rachis spherical to hemispherical; scales of rhizome ovate-lanceolate . . . . .  
 . . . . . 5. *K. tibialis*.
4. Culms 0.4-0.9 mm thick at the apex; always leafless; spikelets 15-45; rhizomes oblique, 0.5-3 mm thick; inflorescence bracts broadly ovate, shorter than the spike . . . . .  
 . . . . . 6. *K. nudiceps*.

## TREATMENT OF THE SPECIES

1. ***Kyllinga pumila*** Michaux, Fl. bor.-amer. 1: 28. 1803. TYPE: U.S.A., southern Illinois, August 1795, *Michaux* (HOLOTYPE: P, Herb. Michaux, photo, DUKE; ISOTYPE: P, Herb. E. Drake, photo, DUKE).
- K. caespitosa* Nees, Fl. bras. 2: 12. 1842. TYPE: BRAZIL. Bahia, *Martius s.n.* (SYNTYPE: M!); Minas Gerais, *Martius s.n.* (SYNTYPE: M!); Pará, *Martius s.n.* (SYNTYPE: M!); Rio Nigri, *Martius s.n.* (SYNTYPE: M!).
- K. caespitosa* var. *major* Nees, Fl. bras. 2: 12. 1842. TYPE: BRAZIL. *Sellow* (not located).
- K. laxa* Schrad. ex Nees, Fl. bras. 2: 14. 1842. TYPE: BRAZIL. Rio de Janeiro, Sebastianopolis, *Martius s.n.* (HOLOTYPE: M!).



*K. pumila*  $\beta$  *b. elatior* Kunth, Enum. pl. 2: 132. 1837. TYPE: TRINIDAD. Sieber 2 in 1825 (HOLOTYPE: B!).

*K. tenuifolia* Steud., Syn. Glum. 69. 1854. *C. tenuifolius* (Steud.) Dandy, Catal. Vasc. Pl. S. Tomé 363. 1944. TYPE: not located; type locality, Senegal.

*K. pumila* var. *elatior* Boeck., Linn. 35: 413. 1868. TYPE: none specified; type locality: "In Americae region calidior."

*K. flexuosa* Boeck., Cyp. nov. 2: 1. 1890. TYPE: JAMAICA. Bellevue, 27 Jan. 1888, Eggers 3753 (HOLOTYPE: B!).

*Cyperus densicaespitosus* Mattf. & Kükenth., Pflanzenreich 4(20): 597. 1936. Based upon *K. pumila*.

Cespitose annual (or short-lived perennial), (5) 15–30 (55) cm tall. Roots fibrous, brownish, rhizome none. Culms trigonous, smooth, 0.7–1.3 mm thick throughout. Leaves 1–3, (7), 4–20 (30) cm long, 1.5–3 (3.6) mm wide, flat to v-shaped, the margins and keel scabrelate, especially distally. Inflorescence bracts (3) 4 (5), (1) 3–10 (22) cm long, (0.5) 1–2.5 (3) mm wide, the margins and keel ciliate-scarbrellate, horizontal to ascendent at 30° at or before anthesis, becoming horizontal to strongly reflexed in maturity. Spikes 1–3, globose-ovoid to cylindrical, 5–8 (11) mm long, 5–7 mm wide; secondary spikes smaller, globose-ovoid, 3–5 mm long, 2.5–4 mm wide; rachis slenderly cylindrical, 3–5 mm long, 0.4–0.7 mm thick; spikelet pedicels 0.1–0.2 mm long, about 0.1 mm thick, separated by one to two times their thickness. Spikelets 50–150, lanceolate to oblong-lanceolate, (1.9) 2.4–2.8 (3.8) mm long, 0.6–0.9 mm wide, contracted below into a stipitate base 0.2–0.4 mm long. Scales ovate (1.8) 2.2–3.1 (3.4) mm long, the mucro 0.1–0.3 mm long, 1–1.7 mm wide, pale brownish to hyaline, laterally 2–3 (4) nerved; keel green, with 3–10 spinulose teeth up to 0.2 mm long, or infrequently smooth. Stamens 2; anthers elliptic, (0.2) 0.3–0.4 mm long, the connective not prolonged; filaments (1.8) 2.4–3 mm long. Styles 0.5–0.8 mm long; stigmatic branches 2, 0.5–0.9 mm long. Achenes oblong, lenticular, 1–1.2 (1.4) mm long, 0.5–0.6 (0.7) mm wide, apex subtruncate, apiculate, base cuneate to rounded, the stipitate portion 0.1–0.2 mm long, about 0.1 mm wide, surface finely papillose, light brown.

**DISTRIBUTION.** (Figure 1). Eastern United States from Pennsylvania and Kansas to Florida and eastern Texas; the West Indies; eastern and central Mexico south through Central America to Argentina; also in tropical Africa. Moist disturbed open soils, wet pastures, roadsides, croplands and thickets, from sea level to about 2000 m.



Figure 1. Distribution of *K. pumila* in Mexico and Central America.

**PHENOLOGY.** Flowers and fruits throughout the year.

**DISCUSSION.** This species is distinguished by its cespitose annual habit. Specimens of *Kyllinga brevifolia* collected without rhizomes are frequently misdetermined as this species, but can be distinguished by their much longer anthers, 0.8–1.1 mm long, versus 0.2–0.4 mm long in *K. pumila*. The cespitose plants of *K. pumila* often have 10–20 culms, and usually several culms will have the anthers exerted and readily visible.

**ILLUSTRATIONS.** Kükenthal (1935–36), p. 596, fig. 63 E–G; Gleason & Cronquist (1952), v. 1, p. 250; Standley & Steyermark (1958), p. 167, fig. 30 A–C.

**REPRESENTATIVE SPECIMENS. MEXICO. Chiapas:** Sta. Anita Huixtla, *Boege* 1078 (MEXU); Mpio. Villa Corzo, *Breedlove* 37674 (DS); Mpio. La Independencia, 45–50 km E of Lagos de Montebello, *Breedlove & Almeda* 57709 (CAS); Mpio. Pueblo Nuevo Solistahuacán, *Breedlove & Thorne* 21536 (DS, ENCB); Escuintla, *Matuda* 297 (MEXU). **D. F.** Pelouse du Pedregal près Mexico, *Bourgeau* 662 (K, with *K. odorata*). **Guerrero:** Dis. Adama, Temisco, *Mexia* 8795 (B, GH, LCU); Dis. Mina, Petlacala, *Mexia* 9042 (B, GH, K, LCU). **Hidalgo:** Mpio. San Bartolo Tutotepec, Santiago, *Gimate* 629 (ENCB, MEXU); Dis. Molango, Lake Atexca, *Moore* 2953 (BH). **Jalisco:** 4.5 mi NNE of Talpa de Allende, *McVaugh* 20232 (BM, DUKE,

ENCB, TEX, MICH); Mpio. de Talpa, SE of Cuale, *González T. 459* (ENCB). **Mexico:** Amatepec, *Matuda 31275* (MEXU). **Michoacán:** 22 km S of Uruapan, *King & Soderstrom 4876* (MICH, TEX, US). **Morelos:** Cuernavaca, *Deam 10* (GH). **Nayarit:** between Chapalilla and Ixtlán on Hwy. 15, *Kral 25659* (ENCB). **Oaxaca:** S of Valle Nacional, *King 2133* (DUKE, MEXU, TEX); between Pochutla and Miahuatlán, near Puente San Juan, *Tucker 2252* (DUKE). **Puebla:** 2 km E of Villa Juárez, *González Quintero 195* (ENCB, MSC). **San Luis Potosí:** 4 km ESE of Tamazunchale, *Rzedowski 9777* (ENCB); Mpio. Xilitla, 5 km W of Ahuacatlán, *Rzedowski 27714* (ENCB). **Tabasco:** Mpio. Cárdenas, campo de investigación CSAT, *Cowan 2468* (CAS, ENCB, MEXU). **Tamaulipas:** Mpio. Gómez Farias, Rancho del Cielo, *Puig 3245* (ENCB). **Veracruz:** Orizaba, *Botteri 194* (BM, CGE); *Bourgeau 2737b* (C, GH, M); Colipa, *Liebmann s.n.*, March 1841 (C, with *K. brevifolia*; K); Mpio. Santiago Tuxtla, Tepalapa, *Martínez-Calderón 1480* (CAS, DS, ENCB); 16 km E of Jalapa on the road to Cuauhtémoc, *Tucker 2135* (DUKE).

**BELIZE.** Belize Dis.: Boomtown, *O'Neill 8974* (C, DS, GH, K, LCU, US). El Cayo Dis.: near Camp 6, *Gentle 2370* (F, GH, K, LCU, MEXU). Stann Creek Dis.: Stann Creek Town, *O'Neill 8972* (LCU).

**GUATEMALA.** Alta Verapaz: Oliva prope Coban, *von Türckheim 6* (BM, G, K, US); Coban, *von Türckheim II 2271* (E, GH). Escuintla: San Andrés Osuna, *Seler 2566* (GH). Huehuetenango: about Laguna de Ocubila, *Standley 82650* (F). Izabal: Quebradas, *Pittier 8562* (GH, US). Guatemala: between Guatemala and San Raimundo, *Standley 63023* (F). Petén: La Libertad, *Lundell 2498* (CAS, LCU). Sacatepéquez: NW of Antigua, *Standley 64664* (F). Santa Rosa: Santa Rosa, *Heyde & Lux 3550* (GH, K, M, US). Zacapa: vic. of Zacapa, *Standley 74272* (F).

**HONDURAS.** Atlántida: vic. La Fragua, *Standley 55701* (F, US). El Paraíso: N of Yuscaran, *Standley 25710* (F). Gracias a Dios: orillas del Río Dursuna, *Nelson 855* (BM); Intibucá: 9 km E of La Esperanza, *Molina & Molina 13997* (F). Morazán: vic. of El Zamorano, *Molina 1591* (F, GH), *Standley 21558* (F). Ocotepeque: Cordillera Merendón, 10 km from Nueva Ocotepeque, *Molina R. 22240* (F).

**EL SALVADOR:** Ahuachapán: vic. of Ahuachapán, *Standley 19842* (GH). San Miguel: vic. of San Miguel, *Standley 21088* (GH). San Salvador: vic. San Salvador, *Standley 23291* (BM, GH). Sonsonate: vic. Sonsonate, *Standley 21791* (GH, US).

**NICARAGUA.** Chontales: Santo Tomas, *Seymour 2785* (MSC). Jinotega: 10 km NE of Jinotega, *Atwood 2093* (F). Managua: El Rodeo, 12 km E of Managua, *Garnier 4472* (GH, LCU). Matagalpa: Sta. Mariá de Ostuma, *Williams et al. 27960* (F). Zelaya: Rama, *Seymour 718* (BM, F, GH).

**COSTA RICA.** Alajuela: waterfall of Río Paz, *Wilbur 33200* (DUKE); vic. Capulin on Río Grande de Tarcoles, *Standley 50090* (US). Cartago: Río Grande de Orosí, *Wilbur 32938* (DUKE); 22319 (DUKE); bords du Río Tuis, *Tonduz 8180* (US); vic. of Tres Ríos, *Godfrey 67181* (DUKE, FLAS). Heredia: Paa Vulkanen Barba, *Oersted 14500* (C); La Selva, OTS Field Sta., *Folsom 10113* (DUKE), *Sperry 1114* (DUKE). Limón: near Cahuita, *MacDougal 1163* (DUKE). Puntarenas: Osa Peninsula, vic. Casa Medio Camino, *Godfrey 66865* (FLAS); 19 km E of Esparza, *Wilbur 29946* (DUKE); 4 km S of Las Alturas, *Wilbur 22707* (DUKE). San José: Ochomogo, *Wilbur 33629* (DUKE); about 3 km E of San Marcos, *Wilbur 32125* (DUKE); Los Yoses, *Wilbur 29439* (DUKE); in the saddle between Barba and Irazú, *Wilbur 14701* (DUKE); El General, *Kupper 1394* (M).

PANAMA. Canal Zone: Near Gatun, *Standley 27276* (US); Barro Colorado Is., *Standley 41120* (US); Ancon Hill, *Standley 25168* (NY). Coclé: vic. El Valle de Antón, *Allen 106* (GH). Colón: Empire Sta., *Hayes 300* (BM); Chagres, *Fendler 343* (GH, NY). Chiriquí: 4 miles NE of El Hato del Volcán, *Wilbur et al. 15316* (DUKE); 6.6 km NNE of Boquete, *Wilbur & Luteyn 19275* (DUKE); vic. of Monte Lirio, *Seibert 237* (GH, LCU, NY); Campamento Fortuna, *Correa A. et al. 2610* (DUKE); Darién: Río Chucunaque above Río Tuquesa, *Stern et al. 836* (GH, US); 1 mile N of Río Sabana, *Tyson et al. 4794* (FLAS). Los Santos: 25 miles SW of Tonosi, *Lewis et al. 2984* (NY). Panamá: Cerro Jefe, *Tyson et al. 4301* (FLAS); Río Tecumen, *Standley 29434* (US); Isla San José, *Johnston 1188* (GH, NY, US).

2. ***Kyllinga odorata*** Vahl, Enum. pl. 2: 382. 1806. TYPE: America meridionali, *von Rohr* (HOLOTYPE: C, not seen).

*K. monocephala* H. B. K., Nov. Gen. Sp. 2: 211. 1816. TYPE: VENEZUELA. Caracas, HUMBOLDT (HOLOTYPE: P; IDC microfiche Herb. H. B. K!), nom. illeg. Art. 63.1.

*K. leucocephala* Baldw., Trans. Amer. Philos. Soc. Philad. n. s. 2: 170. 1825. TYPE: URUGUAY. Maldonado, *Baldwin* (HOLOTYPE: PH!).

*K. sesquiflora* Torr., Ann. Lyceum Nat. Hist. New York 3: 287. 1836. *Cyperus sesquiflorus* (Torr.) Mattf. & Kükenth., Pflanzenreich 4 (20): 591. 1936. TYPE: U. S. A. Middle Florida, *Chapman 12* (HOLOTYPE: NY!).

*K. martiana* Schrad. ex Nees, Fl. bras. 2: 14. 1842. TYPE: BRAZIL. Prov. Pará, *Martius* (HOLOTYPE: M!).

*K. odorata* var. *minor* Boeck., Linnaea 35: 411. 1868. TYPE: MARTINIQUE. *Sieber 18* (HOLOTYPE: not located; ISOTYPE: M!).

*K. odorata* var. *rigida* Boeck., Vidensk. Meddel. 1894: 271. 1895. TYPE: BRAZIL. São Paulo, Franca, *Löfgren & Edwall 2105* (SYNTYPE: C!).

Tufted perennial (5) 10–25 (45) cm tall. Rhizome (rarely collected) horizontal, oblique just below the culms, 3–6 mm thick, internodes 5–12 mm long. Culms triquetrous, smooth, 0.5–1.2 mm thick just above the sheaths, 0.5–1.2 (1.5) mm thick at the apex, bulbous-thickened at the base, clothed with remnants of previous year's leaf sheaths. Leaves (1) 3–7 (10), (6) 10–18 (30) cm long, 2–3 (4) mm wide, erect or arching, ciliate-scabrous along the margins and keel, especially apically. Bracts (2) 3–4, 1–7 (9) cm long, (0.5) 1–3 (4.5) mm wide, ciliate-scabrous along the margins and keel, horizontal to ascendent before anthesis, horizontal to reflexed downward parallel to the culm in maturity. Spikes 1–3 (4), whitish, the central one the largest, densely ovoid to cylindrical, 6–12 (17) mm long, (4) 5–7 (8) mm wide, the other spikes smaller, shorter, ovoid, 3–5 (6) mm long, 3.5–5 mm wide. Rachis slenderly cylindrical, (4) 5–7 mm long, (0.6) 0.8–1 mm thick; spikelet pedicels very short, about 0.2 mm wide, 0.1 (–0.2) mm high, decurrent by a somewhat spongy thickened ridge.



Figure 2. Distribution of *K. odorata* in Mexico and Central America.

Spikelets (50) 75–150, ovate to ovate-lanceolate, whitish, (1.8) 2.3–2.8 (3.6) mm long, 1–1.3 mm wide. Scales broadly ovate, 2–2.5 mm long, (1.2) 1.8–2.6 mm wide, whitish, often red-speckled, mucronate, the apex often excurved, (5) 7 (9) nerved, the keel smooth or with 1–6 spinulose prickles in the distal half, whitish to greenish. Stamens 2; anthers (0.4) 0.6–0.8 (1.0) mm long, linear; filaments 2–2.4 mm long. Styles 0.6–1 mm long; stigmatic branches 2, 0.3–0.6 mm long. Achenes lenticular, oblong-ovate, 1.2–1.5 mm long, 0.7–0.8 (0.9) mm wide, apex broadly rounded to subtruncate, apiculate, the stipitate base 0.1–0.2 mm long, about 0.2 mm wide, surface papillose, reddish brown to dark brown, strongly contrasting with the whitish base and apiculus.

**DISTRIBUTION.** (Figure 2). Pantropic; in the New World in the southern United States from North Carolina to Florida and eastern Texas; the West Indies; Mexico and Central America to Argentina; in Mexico from southern Tamaulipas (Tampico region), eastern San Luis Potosí, Distrito Federal, southeastern Sonora (Yécora) to Nayarit and Chiapas; absent from the Yucatán Peninsula, although it occurs in Belize: croplands, river banks and gravel bars, roadsides, open pine, oak or thorn woodlands from sea level to about 2500 m.

**PHENOLOGY.** Flowers and fruits from May to September, and sporadically as late as January.

**DISCUSSION.** The whitish color of the inflorescence generally is distinctive. As the achenes mature and darken, they become visible through the sides of the scales; thus the inflorescence at maturity is often darker than at anthesis. The broad dark achenes, with conspicuous whitish apiculus and stipitate base when fully mature distinguish this species from others of the genus in the New World.

The size of the anthers varies geographically in this species. In collections from Central America (excluding Guatemala), the average length of the anthers is 0.5–0.6 mm (range: 0.4–0.8 mm), while in Mexico the average is 0.7–0.8 mm (range: 0.6–1.0 mm). The ranges of anther length for these two above regional populations do overlap. Moreover, the average length for Guatemalan specimens was 0.6–0.7 mm, exactly intermediate between the averages for Mexico and the remainder of Central America. Thus there seems to be continuous variation in anther length from Mexico through Central America. The recognition of either the Mexican or Central American populations at varietal rank would be arbitrary. No such formal taxonomic rank is here offered.

**ILLUSTRATIONS:** Godfrey & Wooten (1979), p. 246, fig. 137.

**REPRESENTATIVE SPECIMENS. MEXICO. Chiapas:** Mpio. Angel Albino Corzo, above Jaltenango, *Breedlove* 28562 (DS); La Florida, between Oxchuc and Ocosingo, *Tucker* 2222 (DUKE). **Distrito Federal:** Tlalpam, *Fisher s.n.*, 31 July 1926 (DS, DUKE, US); Cerro Xochitepec, *Rzedowski* 24248 (DS, ENCB, MSC). **Guerrero:** Dis. Mina, Manchón, *Hinton* 9429 (DS, K, MEXU, MICH, NY); about 10 miles from Taxco on Cuernavaca road, *MacDaniels* 125 (BH, F). **Hidalgo:** near Trinidad Iron Works, *Pringle* 8959 (C, CU, E, ENCB, K, GH, M, MEXU, MSC, NY, US); 6 km N of Pachuca, *Garcia* 103 (ENCB). **Jalisco:** Guadalajara, *Palmer* 253a in 1886 (GH, MICH, NY); 3 miles S of Mazamitla, Sierra del Tigre, *McVaugh* 12980 (MICH); 5 road miles SW of Santa Cruz de Las Flores, *McVaugh* 16290A (MICH). **México:** Mpio. de Texcoco, 8 km E of Coatlinchán, *Cruz Cisneros* 1314 (ENCB); Mpio. Zumango, 1 km SE of San Juan Zitlaltepec, *Cruz V.* 71 (ENCB); 60 miles W of Toluca, near Michoacán border, *Manning* 531121 (GH); Temascaltepec, Volcán, *Hinton* 1176 (BM, ENCB, F, K, NY); Cerro de Sacramento, cerca de Amecameca, *Rzedowski* 24202 (ENCB); 5 km W de Progreso Nacional, *Rzedowski* 35296 (ENCB). **Michoacán:** Mpio. Tancitaro, 1 mile S of Tancitaro, *Leavenworth* 376 (F, MICH, MO, NY); 0.8 miles W of Morelia on Hwy. 15, *Kral* 25583 (ENCB); Dis. Zitacuaro, Loma Larga, *Hinton* 13103 (DS, ENCD, K, MICH, NY); 8–10 km SW of Jiquilpan, *Feddema* 4 (DS, DUKE, ENCB, MICH, TEX); 6–7 km N of Uruapan, *Dieterle* 4402 (ENCB, MICH); Morelia, *Arsène* 5752 (B). **Morelos:** 1.5 miles SE of Huitzilac, *Smith* 55

(MEXU); 12 km NW of Cuautla, *Thomas 66* (MEXU). **Nayarit:** 9 miles N of Compostela, *McVaugh 16559* (MEX, MICH); Mpio. Acaponeta, near Labra W of Jesús María, *Norris & Taranto 14170* (MICH); 10 miles SE of Ahuacatlán, on the road to Barranca del Oro, *Feddema 254* (DS, DUKE, ENCB, MICH, TEX); 12 miles SE of Tepic, *Feddema 588* (DS, DUKE, ENCB, MICH, TEX); 1.5 miles W of Mazatán, *Feddema 1073* (DUKE, ENCB, MICH, TEX). **Oaxaca:** 53 km N of Puerto Escondido on the road to Zimatlán, *Roe et al. 560* (F); 16 km NE of Zanatepec, *King 505* (ENCB, MICH). **Puebla:** 1 km W of Villa Juárez, *Galván s.n.*, 7 Sept. 1963 (ENCB). **San Luis Potosí:** Huichihuayón, *Grant 540* (GH, MICH). **Sinaloa:** Sierra Surutato, 3 miles N of Los Ornos, *Breedlove & Thorne 18409* (CAS); San Ignacio, *Montes & Salazar 471* (US); near Colomas, *Rose 1803* (US). **Sonora:** Yécora, *Pennington 108* (TEX). **Tamaulipas:** Rancho del Cielo, 6 km NW of Gómez Farias in Sierra de Guatemala, *Sharp et al. 52029* (MSC). **Veracruz:** near Tampico, *Berlandier 2137* (GH); near Orizaba, *Bourgeau 2589* (C, GH, K); 5.4 miles N of Jalapa on road to Misantla, *Tucker 2077* (DUKE).

**BELIZE.** Belize Dis.: Sibun River, Graig Point, *Gentle 1398* (NY); low pine ridge near Manatee Lagoon, *Peck 39* (GH, K).

**GUATEMALA.** Alta Verapaz: Cubilguitz, *von Turckheim 7691* (K). Chimaltenango: on road to Chichicastenango, *Dunn et al. 22960* (MO). Chiquimula: Volcán Ipala, *Steyermark 30529* (F). Guatemala: near Guatemala City, *Tonduz 672* (GH, NY, US). Huehuetenango: Cerro Victoria, *Steyermark 49592* (F, NY). Izabal: vic. Puerto Barrios, *Standley 25057* (NY). Petén: La Libertad and vic., *Aguilar H. 6* (MICH, in part, with *Cyperus ischnos* Schlecht.); 1 km N of Poptun, *Harmon & Dwyer 2719* (MO). Santa Rosa: Santa Rosa, *Heyde & Lux 3540* (GH, K, M, MICH, US). Zacapa: Sierra de las Minas, between Río Hondo and summit of mtn., above Finca Alejandra, *Steyermark 29708* (F).

**HONDURAS.** Atlántida: between Tela and Lancetilla, *Yuncker 4581* (MICH, with *K. pumila*). Copan: Hac. Espíritu Santo, *Blake 7438* (US). Gracias a Dios: Puerto Lempira, *Proctor 38922* (BM). Morazán: El Zamorano, *Standley 12857* (F); Las Flores, Cerro de Uyuca, *Standley 21696* (F); region of Las Mesas, *Standley 24069* (F). Yoro: N end of Lake Yojoa, *Kamb 2049* (A).

**EL SALVADOR.** San Salvador: San Salvador, *Fassett 28259* (F, GH, WIS).

**NICARAGUA.** Esteli: 10.6 km W of bridge at La Trinidad to San Nicolas, *Stevens 10299* (MO). Managua: Sierra de Managua, *Garnier s.n.*, 1930-1940 (F). Zelaya: Puerto Isabel, *Seymour 2972* (F, GH).

**COSTA RICA.** Alajuela: between Rios Pilos and Zacaros, *Brenes 17319* (F, NY); about 4 km E of Naranjo on the new road to San Ramón, *Wilbur 29960* (DUKE). Cartago: south slope of Volcán Turrialba near Santa Cruz, *Holm & Iltis 132* (A, NY); Cartago, *Oersted 14499* (C). Guanacaste: Bagaces, *Opler 280* (F). Limón: delta du fleuve San Juan, *Pittier 2580* (US). Puntarenas: outskirts of Chomes, *Davidse & Pohl 1327* (MO); Cascajal, *Holm & Iltis 239* (A, NY). San José: 1 km S of San Pablo towards San Marcos, *MacDougal 861* (DUKE); vic. El General, *Skutch 2643* (GH, K, MICH, NY, US); San José: *Tonduz 434* (DS, F, GH, PH).

**PANAMA.** Canal Zone: Frijoles, *Ebinger 79* (F); Mt. Hope Cemetery, *Standley 28807* (US); Miraflores Lake, *Tyson 1410* (FLAS). Chiriquí: Savanne bei David, *Wagner 1 1/2* (M). Coclé: El Valle de Antón, *Seibert 474* (GH, NY). Colón: Colón, *Rose 22086* (GH, NY). Panamá: near Matías Hernández, *Standley 28988* (US); Isla San José, Bald Hill, *Johnston 39* (GH).

3. **Kyllinga brevifolia** Rottbøll, Descr. Icon. Rar. Nov. Pl. 13. t. 4. fig. 3. 1773. *Cyperus brevifolius* (Rottb.) Hassk., Cat. Hort, Bogor. 24. 1844. TYPE: EAST INDIES, *König* (HOLOTYPE: C!; ISOTYPE, C!).

*K. monocephala* Thunberg, Fl. Japon. 35. 1784. TYPE: JAPAN, *Thunberg* (not located).

*K. elongata* H. B. K., Nov. gen. sp. 2: 211. 1816. TYPE: PERU. Between Gonzana and Loxa, *Humboldt & Bonpland* (P; IDC microfiche Herb, H. B. K!).

*K. cruciformis* Schrad. ex Schult., Mant. 2: 137. 1824. TYPE: VIRGIN ISLANDS. St. Thomas, *Ehrenberg 69* (HOLOTYPE: B!; ISOTYPES: C! HAL!).

*K. tenuis* Baldwin, Trans. Amer. Philos. Soc. Philad. n.s. 2: 168. 1825. TYPE: ARGENTINA. Buenos Aires, , *Baldwin* (HOLOTYPE: PH!).

Perennial, (5) 12–25 (55) cm tall, the culms tufted or widely spaced along a conspicuous rhizome. Rhizome (1) 3–12 (30) cm long, (0.5) 1–2 mm thick, clothed with lanceolate scales 6–13 mm long, the internodes (2) 5–12 (30) mm long. Culms trigonous, smooth, 0.6–1.2 (1.5) mm thick throughout. Leaves 1–3, (2) 6–15 (21) cm long, 1.5–3.5 mm wide, flat, scabrellate along the margins and keel especially distally. Bracts 3–4, (1.5) 4–12 (18) cm long, 1–3.3 mm wide, margins and keel ciliate-scabrellate, the longest bract nearly always erect, appearing as a continuation of the culm, the remaining ones ascendent to horizontal. Spikes 1–3, globose-ovoid to cylindric, 4–7 mm long, about 4 mm wide, greenish; rachis slender, 1.5–3.5 (4.1) mm long, 0.4–0.9 mm thick; spikelet pedicels about 0.1 mm long and about 0.1 mm thick. Spikelets (20) 40–60 (100), oblong-lanceolate, (2.2) 2.5–2.8 (3.2) mm long, (0.6) 0.7–0.8 (1.2) mm wide, the base stipitate, 0.1–0.3 mm long. Scales elliptic to ovate, (1.8) 2.2–3.0 mm long, the mucro an additional 0.2–0.3 mm long, (0.8) 1.1–1.6 mm wide, laterally dull whitish to pale brownish or greenish, 2 (3) nerved, occasionally red spotted; keel greenish, 1 (3) nerved, smooth or with 3–6 (–12) spinulose teeth up to 0.2 mm long. Stamens 2 (rarely 1); filaments (1.7) 2–3 mm long. Styles 0.6–1.2 mm long; stigmatic branches 2, 0.5–1.5 mm long. Achenes elliptic to oblong-elliptic, lenticular, 1–1.2 (1.3) mm long, 0.6–0.8 mm wide, apex broadly rounded to subtruncate, base substipitate to decidedly stipitate, 0.1–0.2 mm long, 0.1 (0.2) mm wide, whitish, surface papillose, brownish.

DISTRIBUTION. (Figure 3). Pantropical; in the New World from North Carolina to Texas and Florida; also in California; southern





Figure 3. Distribution of *K. brevifolia* in Mexico and Central America.

and western Mexico south through Central America and the West Indies to Brazil and Argentina. Roadsides, pastures, ditches, marshes and streambanks, from sea level to about 2500 m.

**PHENOLOGY.** Flowering and fruiting throughout the year.

**DISCUSSION.** Delahoussaye and Thieret (1967) reported this species to have only one stamen per flower. However, the majority (about 2/3 of the specimens seen in the present study) had two stamens per flower; the remainder had one. Occasionally plants of the same collection had flowers with both one or two stamens.

O'Neill (1940) in addition to the difference in habit of the two species, separated *Kyllinga brevifolia* from *K. pumila* by a difference in achene width, 0.8 mm in the former, 0.6 in the latter. Apparently this supposed distinction was based upon relatively few collections. I cannot corroborate such a difference. The achenes of *K. brevifolia* are 0.6–0.8 mm wide, while those of *K. pumila* are 0.5–0.6 (0.7) mm wide. The slight difference in the widths of the achenes is hardly a useful means of distinguishing these two species.

ILLUSTRATIONS: Gleason & Cronquist (1952) v.1, p. 250; Kern (1974) p. 658, fig. 70; Godfrey & Wooten (1979) p. 246, fig. 137.

REPRESENTATIVE SPECIMENS. MEXICO. **Chiapas:** Mpio. La Independencia, 6–10 km NNE of La Soledad, *Breedlove 53203* (CAS); Mpio. Arriaga, 13 km N of Arriaga on Hwy. 195, *Breedlove & Davidse 54145* (CAS); Mpio. Pueblo Nuevo Solistahuacán, *Ton 2755* (DS, ENCB, LL); between San Cristóbal and Ocosingo, near Abasolo, *Tucker 2219* (DUKE). **Michoacán:** Morelia, Arsène s.n., April 1912 (E). **Nayarit:** Mpio. de Tepic, *Norris & Taranto 13255* (MICH); Mpio. de Compostela, 5 miles W of Compostela, *Norris & Taranto 13921* (MICH); just E of San Blas, *Philbrick 733* (BH). **Oaxaca:** Cerro Pelón, 47 km N of Ixtlán de Juárez, *González 1016* (ENCB); between San Pedro Pochutla and Miahuatlán, near Puente San Juan, *Tucker 2253* (DUKE). **Puebla:** 1 km W of Villa Juárez, *Rzedowski 17203* (ENCB). **Tabasco:** Tenosique, Boca Cerro, *Matuda 3559* (F, GH, LCU, MEXU, MICH); Santa Unita, *Rovirosa 708* (K, PH). **Veracruz:** near Santiago Tuxtla, *Dressler & Jones 184* (F, GH, NY, US); Colipa, *Liebmann s.n.*, March 1841 (C, K); Cordoba, *Matuda 310* (MICH).

BELIZE. Belize Dis., Belize, *Lundell 1906* (LCU, MICH, MO, TEX). Corozal Dis.: Corozal-Consejo Rd., *Lundell 4973* (B, LCU, MICH, MO, NY).

GUATEMALA. Chimaltenango: near San Martín Jilotepeque, *Standley 64513* (F, MICH). Chiquimula: Montaña Nonoja, 3–5 miles E of Comotan, *Steyermark 31729* (F). Izabal: vic. of Quiriguá, *Standley 24066* (GH, NY); vic. Puerto Barrios, *Standley 24777* (GH, NY). Jalapa: Laguna de Ayarza, *Heyde & Lux 3897* (GH, K, M, MO, NY, US). Petén: Sayaxché, *Steyermark 46279* (F, MICH). Retalhuleu: 9 km N of Champerico, *Harmon 2303* (ENCB, MO). Sacatepéquez: near Las Lajas, *Standley 58106* (F). San Marcos: W of Tajumulco, *Steyermark 36724* (F, US).

HONDURAS. Atlántida: between Tela and Lancetilla, *Yuncker 4581* (F, MICH). Cortés: San Pedro Sula, *García 22* (MO). Distrito Central: San Juancito and vic., *Pfeifer 2008* (US). Gracias a Dios: Puerto Lempira, *Proctor 38922* (BM, with *K. odorata*). Morazán: El Jicarito, *Standley 20484* (F), *20788* (F). Olancho: Culmí, *Nelson & Romero 4652* (MO).

EL SALVADOR. Ahuachapán: vic. Ahuachapán, *Standley 20290* (GH, NY, US). La Libertad: vic. La Libertad, *Standley 23205* (GH, MO, NY, US). San Miguel: south side of Lake Olomega, *Tucker 850* (F, GH, K, MO, NY). San Vicente: vic. San Vicente, *Standley 21157* (GH, NY, US). Santa Ana: N of Metapám, *Rohweder 2176, 2185* (MO).

NICARAGUA. Bluefields: Waspam, *van der Sluijs S. 791* (F). Managua: vic. Managua, *Narvaez 258* (F, GH). Matagalpa: Matagalpa, *Zelaya M. 2298* (CAS, GH, MSC). Zelaya: Puerto Isabel, *Narvaez S. 2883* (DUKE).

COSTA RICA. Alajuela: Carrillos de Poas, *Brenes 19330* (NY); near Río Peñas Blancas, *Hepper 106* (BM). Cartago: Río Grande de Orosi, *Wilbur 30752* (DUKE); Tuis, *Tonduz 11388* (MO, US). Guanacaste: Liberia, *Wilbur 31027* (DUKE). Heredia: La Selva, OTS Field Sta., *Wilbur 33275, 33277* (DUKE). Limón: Talamanca, border of river at Shirores, *Tonduz 9218* (US); 28 miles on R. R. from Puerto Limón, *Cufodontis 642* (F). Puntarenas: vic. of Esparta, *Godfrey 66977* (FLAS, MO). San José: NE of San Jerónimo, *Burger & Stolze 5336* (F, MO, NY, PMA); El General, *Skutch 2859* (GH, K, MICH, MO, NY, US); Los Yoses, *Wilbur 26327* (DUKE). Isla del Coco: Wafer's Creek, *Gómez P. 3279* (F, MO, NY, PMA).

PANAMA. Bocas del Toro: Changuinola, *Lazor et al.* 2608 (FLAS, PMA); vic. Laguna de Chiriquí, *Hart* 82 (K, US). Canal Zone: 3 miles W of Gamboa, *Nee & Mori* 3601 (MEXU, PMA, US, WIS). Chiriquí: Finca Lerida to Boquete, *Woodson et al.* 1155 (GH, NY); 2.5 miles S of Cerro Punta, *Sawyer s.n.*, 2 March 1967 (DS, WIS). Colón: Portobelo, *Wilbur & Luteyn* 11650 (DUKE, with *K. pumila*). Coclé: between Las Margaritas and El Valle, *Woodson et al.* 1773 (GH, NY), 1774 (BM). Los Santos: 25 miles SW of Tonosí, *Lewis et al.* 2944 (NY, US). San Blas: Marra-ganti, *Williams* 1040 (NY, US). Veraguas: 5 miles W of Santa Fé, *Liesner* 945 (GH, PMA, WIS).

4. ***Kyllinga vaginata*** Lam., *Tabl. encycl.* 1: 148. 1791. TYPE: PERU. *Dombey* (LECTOTYPE: here designated: P-LA; photo: DUKE!; ISOLECTOTYPE: C!).

*K. peruviana* Lam., *Encycl.* 3: 366. 1792. *Cyperus peruvianus* (Lam.) F. N. Williams, *Bull. Herb. Boiss.* 2 sér. 7: 90. 1907. TYPE: PERU. *Dombey*, the same as *K. vaginata* (nom. illeg., Art. 63.1).

*K. rigida* Baldw., *Trans. Amer. Philos. Soc. Philad.* n.s. 2: 169. 1825. TYPE: BRAZIL. Rio de Janeiro, *Baldwin* (HOLOTYPE: PH!).

*K. pungens* Link, *Hort. Berol.* 1: 326. 1827. TYPE: not located.

*K. obtusata* Presl, *Reliq. Haenk.* 1: 183. 1828. *Cyperus obtusatus* (Presl) Mattf. & Kükenth., *Pflanzenreich* 4(20): 585. 1936. TYPE: PERU. "In montanis Huanoccensibus," *Haenke* (PR!).

*K. obtusata* var. *cylindrostachyus* Boeck., *Linnaea* 35: 419. 1868. *Cyperus obtusatus* var. *cylindrostachyus* (Boeck.) Kükenth., *Pflanzenreich* 4 (20): 586. 1936. TYPE: BRAZIL. Prov. Bahia, *Sellow* (HOLOTYPE: B!).

*K. tenuis* Boeck., *Linnaea* 35: 423. 1868. TYPE: BRAZIL. *Sellow*, (HOLOTYPE: B. Herb. Kunth!).

Perennial, 20–60 cm tall. Rhizome indurate, 2–3 mm thick, clothed with arched, cucullate, ovate-lanceolate, brown to reddish-brown scales 8–12 mm long, 4–7 mm wide, the internodes 2–12 mm long. Culms single at each node, 0.8–2 mm thick just above the leaf sheaths, 0.9–1.5 (1.8) mm thick at the apex, trigonous, hollow, usually flattened in drying, glabrous. Leaves with short blades 2–10 cm long, 2–4 mm wide, scabrellate on the margins and keel; or, lacking blades, the lower culm with 2–3 (4) bladeless sheaths 2–10 cm long, the sheaths with a conspicuous hyaline to light brown, speckled border 0.5–1.2 mm wide. Inflorescence bracts 2–4, greenish, 1–3 (8) cm long, 1.2–3.5 mm wide, horizontal to reflexed, usually erect and clasping the rachis after the spikelets fall, the margins and keel scabrellate. Inflorescence a solitary subglobose to ovoid head 7–11 mm long, 7–9 mm wide, rounded at the apex, truncate below. Rachis cylindrical to conical, 3.2–5 mm long, 1–1.7 mm

wide. Spikelet pedicels rather closely spaced, separated by about or less than their own width, 0.3–0.4 mm long, about 0.2 mm wide. Spikelets 75–130, lanceolate, stipitate at the base, 2.5–4 mm long, 1–1.3 mm wide. Scales ovate, 2.7–3.4 mm long, 1.6–2.2 mm wide, laterally 3–4 (5) nerved, off-white to pale reddish brown; keel whitish to greenish, 3-nerved, with 2–3 (4) spinulose teeth. Stamens 3 (the upper scale occasionally bearing 2 stamens without gynoeceum); filaments brownish, 1.5–3 mm long; anthers linear (0.9) 1.1–1.3 mm long, the connective tip reddish, usually conspicuous, but less than 0.1 mm long. Styles 1–1.8 mm long; stigmatic branches 2, 1–1.5 mm long. Achenes lenticular, oblong-ellipsoid, 1–1.2 mm long, 0.4–0.6 mm wide, the apex broadly rounded, apiculate, the base cuneate, substipitate, about 0.1 mm long, punctulate, light brown.

**DISTRIBUTION.** The Greater Antilles; Belize to Panama; Surinam to Peru, Brazil and northern Argentina; tropical Africa. Brackish marshes; wet, sunny soil and riverbanks; sea level to about 200 m. This species is not yet known to occur in Mexico. It is apparently rare in Central America; only the six collections cited below have been seen. However, it is fairly common in South America, especially in eastern Brazil, Paraguay, Uruguay and northern Argentina.

**PHENOLOGY.** Flowering and fruiting in April, May and June.

**DISCUSSION.** This species is separated from *Kyllinga tibialis* chiefly by characters of the inflorescence. In *K. vaginata*, the spike is truncate at the base, while in *K. tibialis* the spike is spherical, rounded at the base. The cylindrical rachis of this species is strikingly different from the spherical one of *K. tibialis*.

Kükenthal (1935–36) and Standley (1938) treated this species as *Cyperus obtusatus* (Presl) Mattf. & Kükenth. Kükenthal apparently did not examine the type of *Kyllinga vaginata*. Lamarck cited two collections in his description, Dombey from Peru, and Roussillon from Senegal. The latter, however, is actually a plant of *K. tibialis*. The Dombey collection is here selected as the lectotype of *K. vaginata*. Two phrases in Lamarck's description indicate such a choice, "culmo inferne vaginato" and "involucro brevi triphyllo". The Roussillon collection lacks a lower culm and has only one involucre bract, while the Dombey collection has a clearly visible sheath on the lower culm, as well as three involucre bracts.

The binomial *Kyllinga peruviana* belongs in the synonymy of this species. Since it was also based on Dombey's collection, it is an illegitimate name, which Kükenthal mistakenly placed in the synonymy of *K. tibialis* Ledeb.

One might confuse *Kyllinga vaginata* with *K. brevifolia*, since both species are rhizomatous. However, *K. brevifolia* has long leaf blades (up to 21 cm long) longer inflorescence bracts (up to 18 cm long) and has only one leafless sheath at the base of the culm, while *K. vaginata* has 2–4.

Not all the characters used by Kükenthal (1935–36) to separate *Kyllinga tibialis* from *K. vaginata* are reliable. He separated the two species as follows:

Leaf blades 1–4; bracts longer than the spike; rachis cylindrical	..... <i>K. vaginata</i>
Leaf blades none; bracts shorter than the spike; rachis hemispherical	..... <i>K. tibialis</i>

Both species may have leaf blades or lack them, often on adjacent culms from the same rhizome. Similarly, the inflorescence bracts may be longer or shorter than the spike, sometimes on adjacent culms. The difference in the shape of the rachis holds up well, and combined with the combined with the characters in the key used in the present treatment, show that *K. vaginata* is a species amply distinct from *K. tibialis*.

ILLUSTRATION. Pedersen (1970) p. 376, fig. 69 A–C.

SPECIMENS EXAMINED. BELIZE: Stann Creek Dis.: Stann Creek Town, 20 Feb. 1890, *Robertson 103* (BM), and 19 Sept. 1936, *Redmond 8969* (LCU).

GUATEMALA: Depto. Izabal: brackish marsh near Puerto Barrios, 25 April–6 May 1939, *Standley 72157* (F, MICH).

NICARAGUA: Depto. Río San Juan: Greytown (San Juan del Norte), 1867–68, *Tate 506* (BM, K).

COSTA RICA: Prov. Alajuela: Muelle de San Rafaël-San Carlos, June 1890, *Pittier 2587* (BR, US).

PANAMA: Prov. Bocas del Toro: Bocas; along runway bordering mangrove swamp, 17 April 1969, *Lazor, Tyson & Loftin 2408* (FLAS).

5. ***Kyllinga tibialis*** Ledeb., Diss. bot. pl. doming., p. 6. [May] 1805.

TYPE: DOMINICAN REPUBLIC. *Poiteau* (HOLOTYPE: LE!).

*K. aphylla* (Vahl) Kunth, Enum. pl. 2: 127. 1837. *Mariscus aphyllus* Vahl, Enum. pl. 2: 373 [October] 1805. TYPE: SENEGAL. *Dupuis* (HOLOTYPE: C!).

*K. capitata* P.-Beauv., Fl. Oware 1 (6), t. 31, 1806. TYPE: not located.

*K. globosa* P.-Beauv., Fl. Oware 1 (6), t. 31, 1806. TYPE: Palisot de Beauvois, Herb. Fl. Oware (G!).

*K. peruviana* Lam. var. *foliata* Kükenth., Fedde Rep. 12: 92, 1913. *Cyperus peruvianus* var. *foliatus* (Kükenth.) Kükenth., Pflanzenreich 4 (20): 587, 1936. TYPE: JAMAICA, Ocho Rios, near sea shore, 4 April 1908, Britton & Hollick 2705 (HOLOTYPE: B; ISOTYPE: NY!).

Perennial, 25–70 (85) cm tall. Rhizome indurate, 3–5 mm thick, clothed with arched, cucullate, broadly ovate-triangular, brown to reddish-brown scales, 3–6 mm long, the internodes (2) 5–10 (15) mm long. Culms single at each node, (1.6) 2.5–3.5 mm thick just above the leaf sheaths, (1.2) 1.6–2 mm thick at the apex, roundly trigonous, hollow, flattened in drying, glabrous. Leaves usually bladeless, the lower culm with 3–7 bladeless sheaths 1–5 (7) cm long, the sheaths with a conspicuous cinnamon-brown, scarious border 0.5–1.2 mm wide; leaf blade infrequently present, 1–5 (8) cm long, 3–7 mm wide, marginally scabrellate near the tip. Inflorescence bracts 3–4, brownish or greenish, 3–6 (20) mm long, (1.5) 3–4 (4.5) mm wide, at anthesis loosely clasping the spikelets, in maturity often deflexed. Inflorescence a solitary, globose head 7–12 mm in diameter; rachis spherical to hemispherical, 1.5–3 (4.2) mm high, 2–3 (4.2) mm wide. Spikelet pedicels closely spaced, separated by less than their own width, 0.4–0.8 mm long, 0.2 (0.3) mm wide. Spikelets about 100–200, broadly to narrowly lanceolate, 3.2–3.8 (4.5) mm long, 1–1.4 mm wide. Scales ovate, 2.5–3.3 mm long, 1.6–2 mm wide, dull greenish or brownish white, (5) 7–9 nerved; keel whitish or greenish, smooth or infrequently with 1–3 spinulose teeth less than 0.1 mm long. Stamens 3; filaments whitish, ribbon-like, 2.7–3.3 mm long; anthers linear, 1–1.5 mm long, the connective tip red, up to 0.1 mm long. Styles 0.4–1 mm long; stigmatic branches 2, 1.3–2.3 mm long. Achene lenticular, oblong-obovate, 1–1.5 mm long, 0.7–0.8 mm wide, apiculate, the apex broadly rounded to subtruncate, the base cuneate to substipitate, the surface punctulate, brown to reddish brown.

**DISTRIBUTION.** (Figure 4). Caribbean Islands from Jamaica and Hispaniola to Trinidad; Belize to Panama and Colombia on the Caribbean coast only; not recorded from Mexico. Also in tropical West Africa. Sandy beaches, among littoral vegetation of the upper beach, dunes and swales; margins of mangrove swamps and riverbanks up to about 70 m.

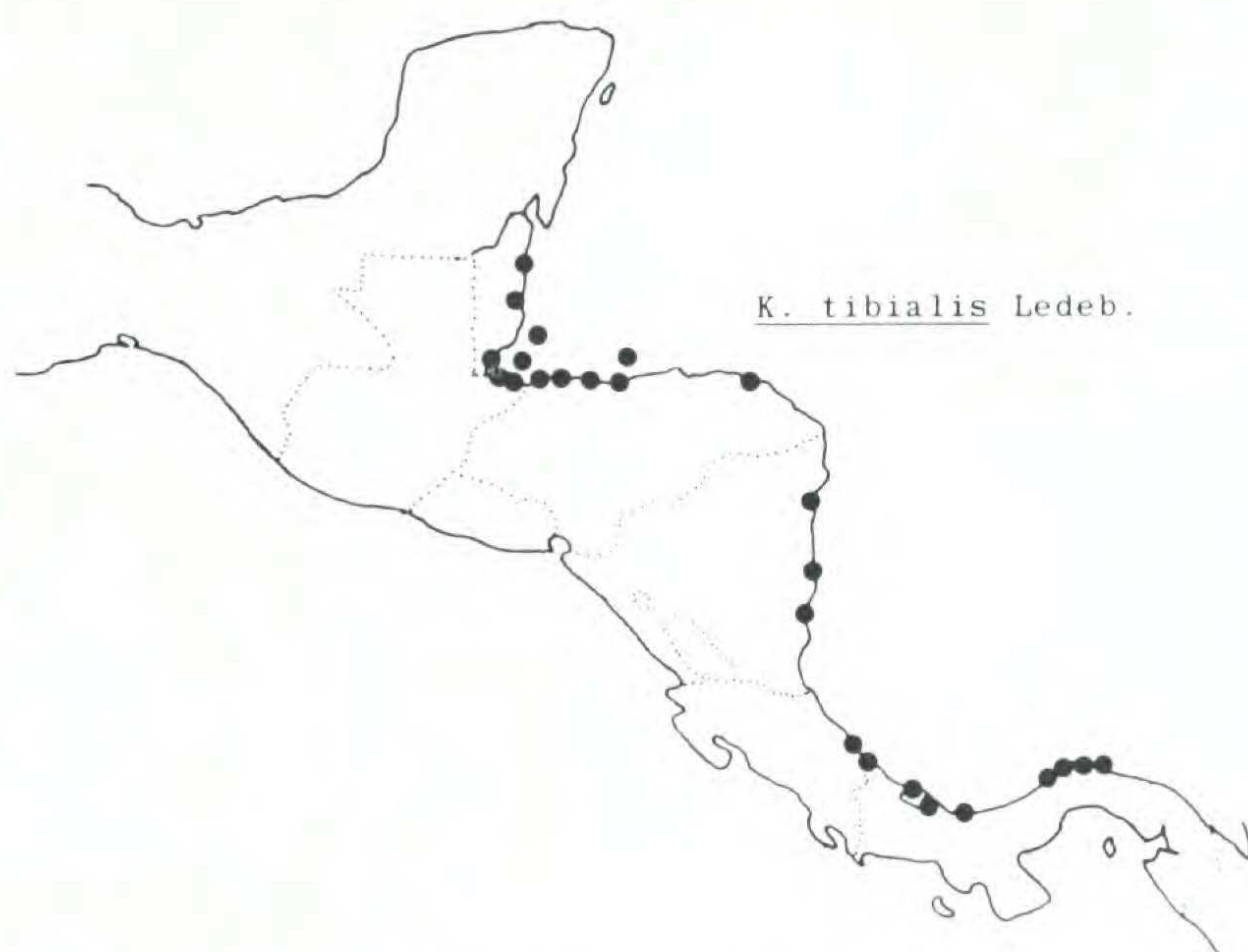


Figure 4. Distribution of *K. tibialis* in Mexico and Central America.

**PHENOLOGY.** Flowering and fruiting throughout the year.

**DISCUSSION.** A discussion of the differences between this species and *Kyllinga vaginata* is given under the latter species.

This species is usually easily recognized by its littoral habitat, and its dense globose inflorescence. In collections with several culms on one rhizome, there is usually at least one old culm from which the spikelets have fallen. The spherical rachis thus revealed is a unique character allowing positive identification of *Kyllinga tibialis*.

Kükenthal (1935–36) treated this species as *Cyperus peruvianus* (Lam.) F. N. Williams, based on the illegitimate name *Kyllinga peruviana* Lam. (see discussion under *K. vaginata*). Thus, *K. tibialis* is the oldest available epithet for this species, antedating *Mariscus aphyllus* Vahl by a few months.

**REPRESENTATIVE SPECIMENS.** BELIZE. Belize Dis.: Pine ridge near Manatee Lagoon, Peck 40 (GH, K). Stann Creek Dis.: Middlesex, Schipp 382 (F, GH, K, MICH, MO, NY); Dangriga, Proctor 36595 (MO); Hatchet Cay, Fosberg 54376 (F, NY); Stann Creek Town, Croat 24111 (MO). Toledo Dis.: Nicolas Cay, Spellman & Stoddart 2343 (MO, US); Punta Gorda, Hedger 271 (BM).

GUATEMALA. Izabal: Livingston, Deam 72 (GH, MICH, MO, NY); Puerto Barrios, Kellerman 5133 (MEXU, US), Standley 25139 (NY, US); NE of Livingston, Steyermark 39710 (F).

HONDURAS. Atlántida: Tela, *Davidse & Pohl 2176* (MO, US), *Molina R. 25727* (F, MO); vic. of Ceiba, *Yuncker et al. 8247* (F, GH, MICH, MO, NY). Colón: Trujillo Beach, *Saunders 142* (BM, MO). Cortés: Puerto Cortés, *O'Neill 8970* (GH, K); Gracias a Dios; alrededores de Puerto Lempira, *Castro T. 191* (MO). Islas de la Bahía: Roatan Is., Flower Bight Beach, *Molina R. 20671* (ENCB, F, US).

NICARAGUA. Bluefields: El Bluff, *Seymour 641* (BM, F, GH). San Juan del Norte: vic. of San Juan del Norte, *Smith 56* (ENCB). Zelaya: Puerto Cabezas, *Molina R. 14851* (GH, US); Puerto Isabel, *Narvaez S. & Atwood 2944* (F, MSC).

COSTA RICA. Limón: Cahuita, *Baker & Burger 22* (F); between Limón & Río Banano, *Davidse & Pohl 1236* (F, MO); Isla La Uvita, *Echeverría 45* (F); 15 km S of Puerto Limón, *MacDougal 1190* (DUKE), *Wilbur 30599* (DUKE); 5 km S of Puerto Limón, *Wilbur 30676* (DUKE).

PANAMA. Bocas del Toro: Santa Catalina, *Blackwell et al. 2697* (NY); Changuinola Valley, bar mouth, *Dunlap 520* (F, US); Bocas, *Godfrey 66317* (FLAS); Laguna de Chiriquí and vic., *Hart 79* (US); Canal Zone: Colón to Empire, *Crawford 579* (PH, NY); Caladonia Harbor, *Elmore L36* (MICH, US); 1.5 km SW of mouth of Chagres River, *Nee 8927* (GH, PMA); France Field, *Standley 28585* (US); vic. Fort Sherman, *Standley 31208* (US); Colón: Colón, *Asplund 15157* (NY); vic. Río Piedras near Porto Belo, *Blum et al. 2537* (FLAS); Colón, *Debeaux 44* (PRC); María Chiquita, *Ebinger 451* (F); vic. Santa Isabel, *Pittier 4175* (US).

6. ***Kyllinga nudiceps*** C. B. Clarke ex Standley, Field Mus. Nat. Hist. Ser. Bot. 4: 199. 1929. *Cyperus nudiceps* (Standl.) O'Neill, Lfl. West. Bot. 4: 38. 1944. TYPE: COSTA RICA, Isla del Coco, *Pittier 16272* (US!; ISOTYPES F!, GH!, LCU!, NY!).

Tufted perennial, (10) 25–40 (55) cm tall. Rhizome short, oblique, 1–3 cm long, (0.5) 2–3 mm thick, closely covered with overlapping, reddish-brown, broadly ovate scales 1–3 mm long. Roots brownish, finely pubescent especially near the rhizome. Leaves bladeless, the base of the culms with about 3 reddish-brown, scarious sheaths (0.6) 2–8 cm long, densely reddish spotted along the apical margins. Culms 0.4–0.8 mm thick just above the apex of the longest sheath, 0.4–0.6 (0.9) mm thick just below the inflorescence. Inflorescence bracts 2 or 3, rather broadly ovate, 1.3–2.8 (3.5) mm long, the cusp an additional 1–2 mm long, 1.5–2.5 mm wide, light reddish-brown to sordid whitish, smooth or often sparsely scabrous along the keel distally, erect to ascendent at anthesis, stiffly erect and clasping the rachis after the spikelets fall. Spike loosely hemispherical, 3.5–4.5 mm high, 5–6 mm wide. Rachis cylindric, (0.9) 1.3–1.8 mm long, (0.4) 0.6–0.8 mm thick; spikelet pedicels rather densely packed, separated by less than their own width, 0.2–0.35 mm long, 0.15–0.2 mm wide, abaxially with a conspicuous toothlike scar from the lowest sterile scale. Spikelets 15–45, elliptic, 2–2.8 mm long, 0.7–1.2 mm wide, dull white to light,



greenish-brown. Scales 2–2.4 mm long, 1.4–2.1 mm wide, 7–11 nerved, keel green to dull whitish, smooth, the apiculate apex up to 0.1 mm long. Stamens 1, 2 or 3; filaments dirty white to light brown, 2–3 mm long; anthers linear-oblong, 0.8–1.1 mm long, the connective tip reddish, up to 0.1 mm long. Styles 0.4–1.4 mm long; stigmatic branches 2, 1.4–2 mm long. Achenes lenticular, broadly ovate, 1.1–1.2 mm long, 0.75–0.8 mm wide, the apex obtuse, the style persistent, the base cuneate to substipitate, surface essentially smooth, light brown.

**DISTRIBUTION.** Endemic to Isla del Coco (Cocos Island), Costa Rica (5° 31' N lat., 87° 03' W long.), in the Pacific Ocean. No collection data on habitat or elevation are available, but the highest point on the island, Cerro Yglesia, is 634 m.

**PHENOLOGY.** Collections have been made in January, July and December.

**DISCUSSION.** Standley in the publication of the species, suggested it was most closely related to *K. tibialis*, as indicated by the leafless culms. In the material cited, it was noted that *K. nudiceps* and *K. tibialis* both also have pedicellate spikelets. All other New World species have spikelets that are nearly sessile on the rachis. Standley stated also that *K. nudiceps* could be distinguished from *K. tibialis* by the former's lack of inflorescence bracts. This is inaccurate, for although the inflorescence bracts in *K. nudiceps* are small, these parts are no smaller in proportion to the height of the inflorescence than in *K. tibialis*. The bracts of *K. nudiceps* do differ in their cuspidate, rather than blunt, apices, smooth margins and brownish color from those of *K. tibialis*. Also, the bracts of *K. nudiceps* are not "perfectly smooth," as O'Neill and Ayers (1944) state, since the keel is usually distally scabrelate.

**SPECIMENS EXAMINED.** Only three collections have been seen. Costa Rica: Isla del Coco: July 1889, *Snodgrass & Heller 944* (GH, K, US); Jan. 1902, *Pittier 16272* (HOLOTYPE: US; ISOTYPES: F, GH, LCU, NY); 5 Dec. 1959, *Klawe 1501* (US).

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## APPENDIX I

## INDEX OF EXSICCATAE

Abbreviations of *Kyllinga* species

b.... <i>K. brevifolia</i>	t.... <i>K. tibialis</i>
n.... <i>K. nudiceps</i>	p.... <i>K. pumila</i>
o.... <i>K. odorata</i>	v.... <i>K. vaginata</i>

Acosta, M. & J. Dorantes. 185 b. Aguilar H., M. 6 o. Arsene, Fr. 5646 o; 5752 o; 10110 o; 11815 b; 11896 b; 12045 b; 7-8-1910 (E) o; Apr. 1912 (E) b. Abbott, R. Q. 242 o. Allen, P. H. 106 p; 887 p; 1379 (GH) p, (NY) b, p; 6114 p. Asplund, E. 15157 t. Atwood, J. 2093 p.  
 Baker, R. & Burger. 22 t. Balls, E. K. B4303 p; B4805 o. Barkely, F. et al. 2533 o; 7560 o. Berlandier, O. 2130 o. Bernoulli, G. 86 p. Blackwell, Correa A. & Ridgway. 2697 t. Blake, S. F. 7327 p; 7438 o. Blum, K. E. et al. 2537 t. Boege, W. 1075 p. Botteri, M. 194 p; 195 o; 765 o, p; 773 p; s.n. July 1856 (US) b. Bourgeau, M. 662 o, p; 2737B p; 2989 o. Breedlove, D. E. 6973C o; 14813 o; 29149 b; 37674 p; 37792 b; 38262 o; 38562 o; 53203 b. Breedlove & Almeda 57709 p. Breedlove & Davidse 54145 b. Breedlove & Raven. 19913 p. Breedlove & Thorne 18409 o; 21536 p. Brenckle, J. F. 47-122 b; 47-139 p. Brenes, A. 14436 o; 15637 p; 17319 o; 19330 b; 19335 p. Burger, W. 7531 p. Burger & Liesner. 6822 p. Burger & Stolze. 5336 b. Burger et al. 10360 t.  
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Galeotti, H. 5865 p. Galván, M. T. 7 Sept. 1963 (ENCB) o. Garcíá, E. R. 103 o. Garcíá, M. 22 b. Garnier, A. 40 b; 785 b; 4401 p; 4455 b; 4472 p; s.n. ca. 1930-1940 (F) o. Gentle, P. 126b; 1398 o; 2370 p; 4973 b. Gentry, A. et al. 7427 t. Gilbert, L. E. 49 o. Glassman, S. F. 1657 p; 1744 p. Godfrey, R. K. 66016 p; 66317 t; 67181 p; 66865 p; 66977 b; 66988 p. Gómez P., L. D. 3279 b. González, S. 980 o; 1016 b. González Quintero, L. 195 p; 286 o; 1453 b. Grant, V. 540 o. Grayum, M. 1219 p; 2035 p; 2198 b. Greenman, J. M. & M. T. 5271 t. Gutiérrez H., C. 92 o. Guzmán C., C. 64 o.

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Kamb, P. 2049 o. Kellerman, W. A. 5133 t; 7407 p. Kerber, E. 52 p. Killip, E. P. 4057 o; 4103 b; 4532 b; 4539 p. King, R. M. 505 o; 1876 o; 2133 p. King & Soderstrom. 4876 p. Klawe, W. L. 1501 n. Kral, R. 25518 o; 25583 o; 25659 o; 25599 o; 25669B o. Kuntze, O. 1831 t; 1992 b. Kupper, W. 1394 p.

Lachica, L. & F. Sánchez. 2101 p. Langlassé, E. 326 o. Lankester, C. H. 231 o. Lazier, T. 10-14 b. Lazor, R. L. 2889 b. Lazor & Correa A. 2754 p; 2843 p. Lazor et al. 240 t; 2408 v; 2608 b; 2790 p. Leavenworth, W. C. 376 o. Leavenworth & Hoogstraal. 1812 o.

Lent, R. W. 342 t; 1061 p. Lewis, W. H. et al. 570 p; 2944 b; 2984 p; 3194 t; 5517 p. Liesner, R. 945 b. Lundell, C. L. 1906 b; 2498 p. 4973 b.

MacDaniels, L. H. 125 o; 357 o. Magaña A., M. A. & R. Curiel. 391 p. Manning, W. E. & M. S. 531121 o. Martínez-Calderón, G. 1480 p. Matuda, E. 297 p; 310 b; 3559 b; 26014 p; 31275 p. Maxon, W. & Harvey. 7896 p. MacDaniels, L. H. 125 o. MacDougal, J. M. 695 b; 755 p; b; 756 o; 861 o; 915 p; 1163 p; 1190 t; 1265 p; 1416 p. McCorckle, J. S. C-252 b. McDaniel, S. 5083 o; 8120 p. McPherson, G. 1129 o. McVaugh, R. 12980 o; 16290A o; 16559 o; 19298 o; 20232 p. Mexia, Y. 8795 p; 9042 p. Mille Pagaza, S. 68 o. Mohr, C. & Botteri. 2 b. Molina R., A. 1591 p; 14788 t; 20671 t; 22240 p; 25727 t. Molina R. & Molina. 13997 p. Montes & Salazar. 471 o. Moore, H. E., Jr. 2953 p. Mori, S. & Bolten. 7394 p. Muller, F. 1995 p. Murry, R. E., Jr. 431 t.

Narvaez, E. 258 b; 2883 b; 2944 t. Nee, M. 7287 b; 8927 t. Nee & Mori. 3601 b. Nelson, C. 855 p. Nelson, C. & M. Hernandez M. 131 t. Nelson & Romero. 4524 t; 4652 b. Nichols, C. E. 915 b. Norris & Taranto 13255 b; 13760 o; 13921 b; 14170 o; 14970 o.

Ochoa, A. 75 p. Oersted, A. 14499 p; 14499a p. O'Neill, H. T. 8970 t; 8972 p; 8974 (DS) o, p (GH, LCU, US) p; 8975 p; 8977 p. Opler, P. A. 280 o. Ortega, J. G. 4472 o.

Palmer, E. 6 p; 82 p; 192 p; 253a o; 444 p. Peck, M. E. 39 o; 40 t. Peñalosa, J. 828 o. Pennington, C. W. 108 o. Pfeifer, H. W. 1352 o; 2008 b. Philbrick, P. N. 733 b. Piper, C. V. 5684 b. Pittier, H. 9218 b; 2403 p; 2445 b, o; 2580 o; 2583 p (?); 2587 v; 4175 t; 4215 t; 4433 b; 4465 o; 4636 o; 8562 p; 16272 n. Polakowsky, H. s.n. 24 June 1875 (BM) p. Pringle, C. G. 3438 p; 8959 o. Proctor, G. R. 38922 b, o; 36595 t. Puig, H. 3245 p.

Redmond, R. 8969 v. Rivera, E. 7 p; s.n. 11 Aug. 1974 (PMA) p. Robertson, J. 103 v. Rodríguez, J. V. 29 p; 274 b. Roe, K. et al. 560 o. Rohweder, O. 2176 b; 2185 b. Rose, J. N. 1803 o; 22086 o; 23996 b. Ross, G. B. 8-57 p. Rossbach, G. B. 3407 o; 3656 p. Rovirosa, J. 426 p; 708 b. Rzedowski, J. 1642 o; 17203 b; 18940 p; 19057 p; 24202 o; 24248 o; 27640 o; 27714 p; 31257 o; 35296 o.

Santos, J. V. 3316 o. Saunders, J. 142 t. Sawyer, J. L. s.n. 2 March 1967 (DS, WIS) b. Schaffner, J. G. 137 p. Schiede, C. J. W. s.n., July 1829 (HAL) b. Schiede & Deppe. s.n. Oct. 1829 (BM) b. Schipp, W. A. 382 t. Schmidt, M. s.n. in 1936 (B) p. Schmitz, J. 809 p. Seaton, H. E. 292 (F, US) p (GH) o. Seibert, R. J. 237 p; 474 o.

Seler, E. 801 o; 1887 p; 2566 p. Seymour, F. C. 641 t; 718 p; 2785 p; 2972 o. Sharp, A. J. et al. 44255 o; 45935 p; 52029 o. Skutch, A. F. 2643 o; 2859 b. Smith, W. T. 55 o. Snodgrass, R. E. & E. Heller. 944 n. Spellman, D. L. & Stoddart. 2171 t; 2343 t; 2381 t; 2400 t; 2469 t. Sperry, J. 1114 p. Standley, P. C. 1682 p; 12048 b; 12857 o; 19348 p; 19842 p; 20290 b; 20484 b; 20788 b; 21088 p; 21157 b; 21558 p; 21696 o; 21773 b; 21696 o; 21773 b; 21791 p; 21810 o; 22420 p; 22511 o; 22907 p; 23205 b; 23291 p; 23467 p; 24066 b; 24069 o; 25154 (GH) b, p (NY) b; 24356 p; 24777 b; 25057 o; 25139 t; 25168 p; 25710 p; 27276 p; 28585 t; 28807 o; 28988 o; 29434 p; 30885 b; 31208 t; 32240 p; 32742 (US) b, p; 36730 p; 40090 p; 41120 p; 41240 p; 43508 p; 53001 t; 53739 (F, NY) b (US) p; 53800 t; 55701 b, 58106 b; 63023 p; 64513 b; 64664 p; 72157 v; 72160 b; 74272 p; 72487 b; 82140 p; 82650 p. Stern, W. L. et al. 836 p. Stevens, W. D. 10299 o. Steyermark, J. A. 29708 o; 30529 o; 31729 b; 36724 b; 39710 t; 46279 b; 49592 o. Stork, H. E. 2727 p; 3189 t. Svenson, H. K. 4495 o.

Tate, R. 506 v; 515 t. Taylor, J. 17348 p. Taylor & Taylor. 11344 b. Thomas, C. H. 66 o. Thorne, R. F. & E. Lathrop. 41035 p. Ton, A. S. 1685 p; 2755 b. Tonduz, A. 434 o; 672 o; 4793 p; 8180 p; 8264 p; 8849 o; 9122 t; 9218 b; 11388 b; 17906 p; 17907 p. Tucker, G. C. 2077 o; 2088 p; 2135 p; 2160 p; 2219 b; 2222 o; 2252 p; 2253 b. Tucker, J. M. 850 b; 1326 p. Tyson, E. L. 1410 o; 1600 o. Tyson & Smith. 4163 p. Tyson et al. 4301 p; 4794 p.

Valerio, M. 294 p. van der Sluijs, D. H. S. 791 b; S.799 t. Vaughan, J. et al. 1086 o. von Türckheim, H. 6 p; 663 p; 3586 b; 7691 o; 7691B (US) p, (K) o; 8843 t; II 2271 p.

Wagner, M. 1-1/2 o. Webster, G. L. 12654 t. Wercklé, C. 664 p. Whitefoord, C. 1077 p; 2390 p. Wilbur, R. L. 14701 p; 21311 p; 21614 p; 22319 p; 22455 p; 22707 p; 24899 p; 26327 b; 27511 o; 28020 (DUKE) b, p; 28941 p; 28977 p; 29439 p; 29755 p; 29946 p; 29960 o; 29970 p; 30599 t; 30676 p; 30743 p; 30752 b; 30876 p; 31027 b; 31028 p; 32125 p; 32735 p; 33005 p; 33200 p; 33275 b; 33277 b; 33313 p; 33338 p; 33629 p. Wilbur & Luteyn. 11650 (DUKE) b, p; 18888 p; 19275 p. Wilbur et al. 11998 b; 13493 p; 15316 p. Williams, L. O. et al. 16893 o; 24325 b; 27960 (F) b, p. Williams, R. S. 1040 b. Wilson, P. 199 o; s.n. 16 Jan. 1903 (NY) t. Woodson, R. E. & R. W. Schery. 557 p; 770 b. Woodson et al. 1155 b; 1773 (GH) b, o; 1774 b. Worth, C. R. 8906 b.

Yong, G. s.n. 18 May 1977 (PMA) p. Yuncker, T. G. 4581 (F, MICH) o, p; 4674 t; 8247 t.

Zelaya M., H. 2298 b. Zuill, H. 575 p.

## APPENDIX II

## INDEX TO NAMES IN THIS TREATMENT

The number in parentheses following each binomial tells to which species it is referred in the present treatment.

(C = *Cyperus*; K = *Kyllinga*; M = *Mariscus*)

- C. brevifolius* (Rottb.) Hassk. (3)
- C. densicaespitosus* Mattf. & Kükenth. (1)
- C. nudiceps* (Standl.) O'Neill (6)
- C. obtusatus* (Presl) Mattf. & Kükenth. (4)
- C. obtusatus* var. *cylindrostachyus* (Boeck.) Kükenth. (4)
- C. peruvianus* (Lam.) F. N. Williams (4)
- C. peruvianus* var. *foliatus* (Kükenth.) Kükenth. (5)
- C. tenuifolius* (Steud.) Dandy (1)
- K. aphylla* (Vahl) Kunth (5)
- K. brevifolia* Rottb. (3)
- K. caespitosa* Nees (1)
- K. caespitosa* var. *major* Nees (1)
- K. capitata* P.-Beauv. (5)
- K. cruciformis* Schult. (3)
- K. elongata* H. B. K. (3)
- K. flexuosa* Boeck. (1)
- K. globosa* P.-Beauv. (5)
- K. laxa* Schrad. ex Nees (1)
- K. leucocephala* Baldw. (2)
- K. martiana* Schrad. ex Nees (2)
- K. monocephala* Thunb. (3)
- K. monocephala* H. B. K. (2)
- K. nudiceps* Standl. (6)
- K. obtusata* Presl. (4)
- K. obtusata* var. *cylindrostachyus* Boeck. (4)
- K. odorata* Vahl (2)
- K. odorata* var. *minor* Boeck. (2)
- K. odorata* var. *rigida* Boeck. (2)

- K. peruviana* Lam. (4)  
*K. peruviana* var. *foliata* Kükenth. (5)  
*K. pumila* Michx. (1)  
*K. pumila*  $\beta$ . *b. elatior* Kunth (1)  
*K. pumila* var. *elatior* Boeck. (1)  
*K. pungens* Link (4)  
*K. rigida* Baldw. (4)  
*K. sesquiflora* Torr. (2)  
*K. sororia* Kunth (3)  
*K. tenuifolia* Steud. (1)  
*K. tenuis* Baldw. (3)  
*K. tenuis* Boeck. (4)  
*K. tibialis* Ledeb. (5)  
*K. vaginata* Lam. (4)  
*M. aphyllus* Vahl (5)